BLM LIBRARY
88072655

FIRE SCIENCE DIGEST
Research Supporting Sound Decisions

ISSUE 24 FEBRUARY 2017

Bridging the Gap: Joint Fire Science Program Outcomes

The Joint Fire Science Program (JFSP) has funded an impressive number of research projects over the years. However, the number of projects does not necessarily provide an accurate picture of the program's effectiveness. Over the last decade, researchers have collected data and conducted several studies to determine whether the results of JFSP-funded projects are reaching potential users and informing management decisions and actions. Those studies have helped identify issues and influence changes within the program. Early studies pointed out the need for a boundary-spanning organization to improve delivery of science information, which resulted in the establishment of the Fire Science Exchange Network. They also identified other issues pertaining to access to and exchange of science information, which led to improvements by members within the network. While some studies showed that JFSP-funded research is being used for planning and for supporting treatment prescriptions, they also identified barriers that prevent greater use of fire science information by the broader fire management community. These outcomes studies are an important tool to help the JFSP address those barriers and continue to make program improvements.

SD
421.3
.F577
no.24

"Science is the best idea humans have ever had.
The more people who embrace that idea, the better."

— Bill Nye the Science Guy

Even the most impressive research isn't worth much if potential end users aren't aware of—or do not use—the related results and recommendations. The core mission of the Joint Fire Science Program (JFSP) is to fund and disseminate research that is responsive to user needs and addresses problems associated with managing wildland fire, fuels, and fire-affected ecosystems. Until about 10 years ago, the JFSP lacked detailed information about how much its fire research is used, who is using it, and how it is influencing wildland fire management decisions.

The JFSP, established in 1998, provides science-based support to wildland fire and fuels treatment programs. Partnering agencies include the Forest Service in the U.S. Department of Agriculture (USDA) and the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service, U.S. Geological Survey, and Office of Wildland Fire in the U.S. Department of the Interior (DOI). To date, the JFSP has awarded funding for more than 800 research projects. Although such output seems impressive, the program continues to address the question of whether funded research has successfully met the needs of the prospective end users—that is, fire managers, fire ecologists, fuels management specialists, and policymakers within land management agencies. As Hunter (2016) points out, when agencies sponsor numerous research projects, there can be a tendency to overemphasize outputs, such as numbers of publications, while underemphasizing outcomes, such as contributions to land management procedures and policies.

The JFSP has worked hard to design, establish, and maintain an effective science delivery program over the years, but without empirical data, evaluating the effectiveness of this large research program is difficult and largely anecdotal. The JFSP has funded several projects over the past decade to collect data and evaluate program outcomes to answer such key questions as: How relevant is the fire science supported by the JFSP? How many managers have been using it, how are they using it, and where? What factors influence managers' decisions to use or not use fire science? How have outreach efforts increased awareness of fire science? Such work reflects the program's ongoing desire to understand, monitor, and adapt to land managers' needs for high-quality, actionable fire science.

Fostering Good Outcomes

Early JFSP studies found that ineffective communication between managers and researchers is a common phenomenon. Finch and Patton-Mallory (1993) had previously identified some potential barriers to effective communication between researchers and managers in the wildlife management realm: "Gaps originate from differing patterns of language use, disparities in organizational culture and values, generation of knowledge that is too narrowly focused to solve complex problems, failure by managers to relay informational needs, and failure by researchers to synthesize and package knowledge in useable forms." Wright (2010) identified additional contributing factors, including dissimilar or conflicting job functions and goals, differing time and money allocations, differing ideas and perceptions among individuals, lack of trust, and many others.

In 2009, in response to a study by Barbour (2007) and an external program review, the JFSP established a network of 15 fire science exchanges across the United States to facilitate information exchange between fire researchers and practitioners (Figure 1). Participants in these exchanges, as well as the network itself, serve as so-called **boundary spanners**, which are essential for enhancing science delivery and maintaining open communication between managers and researchers (see sidebar titled "What Is a Boundary Spanner?").

The Fire Science Exchange Network is a conduit for conveying information among many types of professionals and other stakeholders interested in fire science. Examples include research principal investigators, fire ecologists, cooperative extension specialists, educators in academic institutions, land managers, and program funders. To date, the 15 exchanges have fostered communication and collaboration by providing access to the latest publications, offering webinars and workshops, sponsoring field tours, hosting discussion forums and

#14366668316
ID: 88072655

SD
421.3
.F577
no.24

BLM Library
Denver Federal Center
Bldg 50, OC-521
P.O. Box 25047
Denver CO 80225

Figure 1. The Fire Science Exchange Network established by the Joint Fire Science Program.

symposia, and promoting other interactions between managers and researchers. For instance, the Northern Rockies Fire Science Network, which is a JFSP exchange in the interior northwestern United States, sponsors the Network of Fire Science Champions, a community of scientists and land managers who interact through periodic conference calls to share experiences and learn about the latest scientific knowledge and tools for fire and fuels management. In addition, participants can discuss potential science and science delivery needs with the exchange's development team.

Conducting the Research

The outcomes research conducted to date has had various objectives and used different methods for evaluating JFSP effectiveness. Some researchers conducted their assessments based on program-level data (Barbour 2007; Wright 2010; Sicafuse et al. 2011; Maletsky et al. 2016), whereas other researchers evaluated outcomes based on individual JFSP-funded studies (project-level assessments) (Seesholtz 2008; Hunter 2016). (See sidebar titled "About the Researchers.")

At the program level, Barbour (2007) focused his research on the relevance of JFSP-funded research as a whole—that is, whether it was contributing positively to agency land management. The research also questioned the effectiveness of the JFSP's science

What Is a Boundary Spanner?

Land management professionals are familiar with the myriad of specialized words, phrases, and acronyms that are an inevitable part of professional communications. Sometimes those specialized terms require translation or simplification to increase understanding across professions or different audiences. Social scientists call the people or mechanisms that perform this function **boundary spanners** (Kocher et al. 2012). If that label evokes images of bridges crossing between adjacent worlds, then you're not far off the mark. The principal participants in the 15 JFSP fire science exchanges, such as fire ecologists from agencies and participating universities—and the exchanges themselves—would be considered boundary spanners. In the wildland fire realm, these people and mechanisms serve as conduits for facilitating two-way communication of science between managers and researchers (Wright 2010; Kocher and others 2012). Indeed, the JFSP established the Fire Science Exchange Network for just that purpose. Ultimately, professionals who perform this function—whether they are called boundary spanners, technology transfer specialists, or science translators—are indispensable for bridging the inevitable divide between managers and researchers seeking practical applications of fire science.

About the Researchers

Outcomes research by the following principal investigators and associates has greatly helped the JFSP Office and Governing Board evaluate and improve program effectiveness to date:

- **Jamie Barbour** was the program manager for focused science delivery at the USDA Forest Service Pacific Northwest Research Station during his outcomes research between 2006 and 2008. Barbour is currently the lead for the National Inventory, Monitoring, and Assessment Implementation Team; Washington Office Deputy Chief for National Forest System Staff.
- **Vita Wright** has been a science applications specialist with the USDA Forest Service Rocky Mountain Research Station since 1998. She is also the principal investigator for the JFSP Northern Rockies Fire Science Network and studies influences on the communication and use of fire science.
- **William Evans and Loretta Singletary** from the University of Nevada, Reno, led a team of social scientists in evaluating the JFSP Fire Science Exchange Network using multiple assessment methods, including a national esurvey and web metrics, beginning in 2010. Team members included Lorie Sicafuse and Lisa Maletsky, research associates from the Department of Education Psychology, Counseling, and Human Development.
- **Molly Hunter**, a research scientist with the School of Natural Resources and the Environment at the University of Arizona, used social science research methods to study awareness, attitudes, and use of JFSP-funded research between 2011 and 2015.

outreach. As Barbour put it, "The goal was to promote organizational change through a two-way transfer of information between researchers and those who put new knowledge, methods, and tools into use." Barbour's research team initially developed short summaries of 138 JFSP-funded projects that had been completed as of 2005 and classified them according to 11 major themes, such as fuels research, fire behavior modeling, remote sensing, fire regimes, and decision support models. The team then surveyed managers from the various agencies that contribute to JFSP's operating budget, soliciting perspectives and opinions about the utility of the fire research and subsequent outreach efforts. For comparison, Barbour's team also surveyed principal investigators who had conducted JFSP-funded research to obtain their perspectives and opinions about science delivery practices.

Similarly, Wright (2010) designed her research to help JFSP managers evaluate program-level effectiveness during a 10-year program review. Wright interviewed and surveyed federal fire and fuels managers and decisionmakers, including local and regional staff specialists, and obtained descriptive data about their professional traits and backgrounds. Based on a survey of 495 managers, she summarized the interviewees' perceptions and opinions about the usefulness and ease of use of JFSP-funded research, and she assessed their relationships with and perceptions about scientists. Wright also analyzed data on organizational learning environments, supervisor and agency support of science, and research use. Wright (2010) states that without such data, JFSP managers, boundary spanners in the Fire Science Exchange Network, and principal investigators would likely have a difficult time identifying the science delivery and application needs of prospective end users.

In 2010, the JFSP continued its effort to analyze and improve program outcomes by funding a multiyear study conducted by a team of social scientists from the University of Nevada, Reno, Cooperative Extension College (Sicafuse et al. 2011; Maletsky et al. 2016). This multiyear study used a theoretical framework called a logic model (McLaughlin and Jordan 1999). The model is a conceptual tool for evaluating program effectiveness, or, in the words of retired JFSP Director John Cissel, "In its simplest form, a logic model is a graphic representation that shows the logical relationships between inputs, outputs, and outcomes." Figure 2 illustrates the logic model for JFSP objectives.

Conceptually, logic models can be simple or comparatively complex. Figure 2 shows the outcomes segment subdivided into numerous short- to long-term research effects on natural and societal environments. One of the main goals of JFSP-funded research is to help land managers restore forest and rangeland ecosystems, which is an example of a potential long-term effect. This goal involves providing science information to managers in a way that helps them make informed decisions. In other words, science delivery is nearly as important as the research itself because the JFSP exists primarily to support managers in accomplishing their jobs.

Over the past 6 years, the team's goal has been to track the overall effectiveness of the Fire Science Exchange Network in its role as a boundary spanning organization. The study consisted of four components: 1) conducting extensive web surveys of

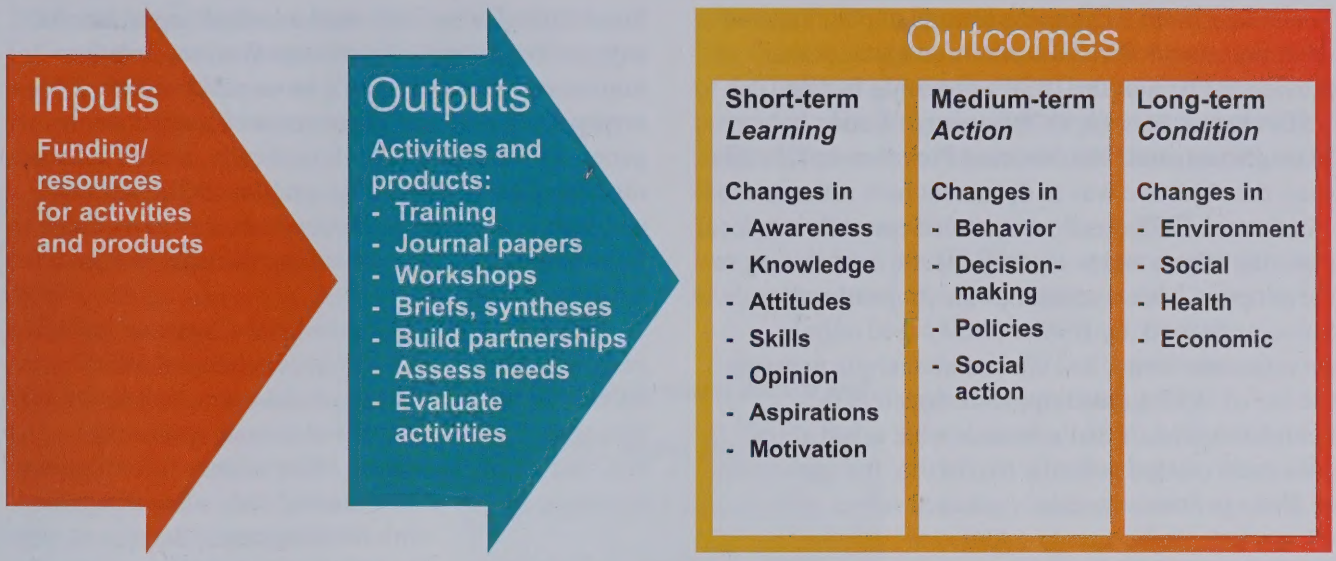


Figure 2. A logic model for JFSP objectives, showing the relationship between three major variables (inputs, outputs, outcomes) and an array of associated subfactors that can influence program effectiveness.

users, scientists, and others; 2) conducting personal interviews with exchange personnel; 3) analyzing web metrics that described website use patterns and other elements (see sidebar titled "Web Metrics and the JFSP"); and 4) using the data collected to develop a guide to help the network conduct self-assessments.

Some key questions posed by the online survey included topics previously identified by Wright (2010) and other exchange social scientists:

- During the last year, how often did you use information derived from your exchange's website?
- Does your exchange's website provide a forum where you can share information and ask questions?
- Have you worked jointly with fire scientists on a research or management project?
- Is fire science information easy to find [through the Fire Science Exchange Network]?
- During the past year, have you changed at least one thing in your work based on what you've learned from fire science?

In short, the survey helped the social scientists analyze not only whether prospective end users had sought and used JFSP-funded science, but also whether the network had served as an effective conduit for two-way information exchange.

In contrast to the program-level research cited above, two comparatively fine-grained assessments documented prospective end users' awareness and use of specific JFSP-funded research. For example,

Web Metrics and the JFSP

Analyzing website infrastructure and use patterns, also known as web metrics or web analytics, has helped evaluate JFSP outcomes. An extensive study by Maletsky et al. (2016) produced some interesting data about the Fire Science Exchange Network's websites. For example, the researchers analyzed website effectiveness by determining not only numbers of website visitors, but also the extent to which users had engaged with the sites. Determining web traffic counts is a fairly straightforward process, but interpreting patterns of user engagement can be more challenging. The researchers found that overall numbers for both new and repeat visitors to network websites had been steady or increasing over the course of five survey waves (interview years). Therefore, visitor trends suggested both successful recruitment of new users and continued engagement with previous users. The researchers also found that webpages with event and webinar content were the most commonly visited sites. Those pages also had the longest viewing times—suggesting effective engagement with the fire science community in terms of interactive events and products.

Not surprisingly, the JFSP Fire Science Exchange Network is increasingly using social media such as Facebook, Twitter, YouTube, and email subscription feeds. For example, the exchanges use Twitter to expand awareness among fire science professionals and organizations, Facebook to interact with community members, and Vimeo and YouTube videos for fire managers and others studying ecological science. Maletsky et al. (2016) noted that users provided mostly positive feedback, indicating that the information on the websites and social media is accessible, flexible, useful, and easy to navigate.

Seesholtz (2008) examined a sample of planning and other documents derived from three agencies that provide the bulk of the JFSP's operating budget (the USDA Forest Service, DOI Bureau of Land Management, and DOI National Park Service). In this case, the objective was to document how often and to what extent JFSP users incorporated research into local planning efforts and to identify factors contributing to the adoption of new science at the project level. Subsequent work by Hunter (2016) used online surveys, interviews, and document analysis to assess the use of JFSP-funded research. Specifically, boundary spanners and scientists were asked about awareness of, and potential barriers to, the application of findings from a randomly selected subset of 48 research projects (out of 431) funded by the JFSP as of 2011. Hunter also examined the references sections of recent planning documents to determine how often land managers cited peer-reviewed publications or other products from the 48 projects.

"... managers found research that produced user guides and other tools to be some of the most useful ..."

Program Level

The program-level assessments to date have provided useful data about JFSP strengths and inherent challenges with respect to science outreach and information exchange—that is, success stories as well as potential barriers. During a 10-year program review, for example, JFSP managers and the Governing Board reviewed data suggesting that land managers often were not using delivered science as intended by principal investigators or were not using delivered products at all (Barbour 2007; Seesholtz 2008; Wright 2007; Wright 2010). A survey of land managers by Wright (2010) revealed some common professional traits that presumably are beyond the JFSP's control as possible contributing factors. The survey found that subgroups within the fire management community differ in how receptive they are to research. For example, fire ecologists and fire analysts in the National Park Service, professionals with graduate degrees, and professionals at higher pay grades were more likely to have positive beliefs and attitudes about research and to use research than other subgroups of respondents.

Wright (2010) also shed light on potential barriers to science use. Lack of time for gathering, interpreting, and implementing science was a frequently cited factor, as were politics and other institutional factors. Some interviewees also cited a lack of organizational support for, and absence of individual rewards for, implementing science. On a more positive note, respondents' attitudes about research and outreach generally were favorable. Specifically, lack of relevant research, lack of knowledge on how to find research, and lack of knowledge about whom to contact for information support were among the least likely barriers cited.

Sicafuse et al. (2011) received a range of survey responses on the value and accessibility of JFSP-sponsored science. Although end users such as fire managers typically expressed overall agreement with the survey statement, "Fire science information enhances my job effectiveness," they often disagreed with the statement, "Science is easy to apply to my specific problems." These responses indicate that barriers remain that can adversely affect science delivery and use. Examples of intractable barriers are those caused by institutional or bureaucratic factors (lack of management funding or lack of science-oriented personnel within land management agencies), lack of trust between managers and researchers, differing attitudes about the potential value and utility of science, differing abilities and motivational drives among individuals, and many other factors.

As for other potential barriers, multiple investigators found that land managers often had a difficult time keeping abreast of recent or ongoing science (Barbour 2007; Seesholtz 2008; Wright 2007; Wright 2010; Hunter 2016). Some respondents said that closely related research projects funded by the JFSP often weren't effectively linked in such a way that potential end users could readily access similar bodies of work. (Note that user-friendly tools such as searchable online databases of fire science did not exist during the program's early days.)

In a similar vein, Barbour's (2007) survey respondents also expressed a desire for more research syntheses such as general technical reports (GTR) that compile results from closely related science. He also concluded that managers found research that produced user guides and other tools to be some of the most useful and that they sought such tools. Examples of research-related tools are the Fuel Characteristic Classification System (FCCS) (Ottmar et al. 2007) and Digital Photo Series (Wright et al. 2007). Seesholtz (2008) agreed that data syntheses sponsored by the

JFSP and other entities such as the Fire Effects Information System (http://www.feis-crs.org/feis/) and the Rainbow Series of GTRs (for example, Brown and Smith 2000) were among the most highly valued products.

Barbour (2007) also examined the so-called proof of concept—that is, he assessed whether empirical evidence supported common assumptions about the JFSP's effectiveness. For instance, he found that although most technology transfer activities at that time revolved around seminars, presentations, and publications, they were not necessarily the most popular outreach products. In contrast, only about one-quarter of JFSP-supported research projects had included activities like field trips, which generally have greater appeal to managers. Part of the problem, Barbour concluded, was that principal investigators themselves had devised and conducted most early outreach efforts. Barbour suggested that a more effective approach might be to use a corporate technology transfer model in which program managers and science advisors would set technology transfer priorities with input from principal investigators, prospective end users, and boundary spanners. Barbour also concluded that the lack of a corporate technology transfer model likely helped explain why some managers found it difficult to understand fire science clearly or to incorporate it into their job functions successfully.

Most of the outcomes research emphasized the crucial role of boundary spanners. Barbour (2007) stated, "Many field-level interviewees reported that the most important source for accessing research was 'informal information networks' or key individuals that they know personally." Wright (2010) likewise emphasized that a system of boundary spanners would be essential for disseminating JFSP science and maintaining open lines of communication between the researchers and end users. She pointed out that boundary spanners typically are more dedicated to, and more capable of, finding, communicating, and evaluating science than most end users are. Wright (2010) suggested that agency fire ecologists, fuels specialists, and other management-oriented professionals could benefit from receiving formal training to serve as boundary spanners and that ideally their formal job duties should incorporate the boundary spanning function. Note that the JFSP established the Fire Science Exchange Network in 2009 as a result of the Barbour (2007) research. Its establishment coincided with Wright's work, and the exchanges did in fact adopt some of her recommendations to improve the network.

Soon after the Fire Science Exchange Network was established, the JFSP began sponsoring multiyear studies by a team of researchers from the University of Nevada, Reno, to evaluate the network's effectiveness as a boundary-spanning entity (Sicafuse et al. 2011; Maletsky et al. 2016). By distributing its survey on an annual basis, the team was able to conduct a longitudinal analysis to explore the effectiveness of the Fire Science Exchange Network over time. Below are some of the consistent, multiyear trends that emerged from the annual data compiled over this period:

"... interviewees reported that the most important source for accessing research was 'informal information networks' or key individuals..."

- Most consumers (land managers) who completed the survey agreed with the statement that they often draw on fire science when making work-related decisions.
- Most consumers and producers (scientists) who completed the survey were familiar with their respective [exchange's] program and believed that it had helped increase science accessibility, understanding, and application.
- Most consumers and producers who completed the survey reported positive experiences with their [exchange's] website, indicating that the sites were largely user-friendly and had provided a wide variety of up-to-date science (see sidebar titled "Web Metrics and the JFSP").
- Consumers and producers who completed the survey generally had positive attitudes toward one another, but the producers viewed themselves as more approachable than consumers perceived them to be. Although consumers and producers often expressed a desire to work with one another, producers expressed this desire more strongly.

Maletsky et al. (2016) suggested that participating managers had significantly increased their ratings of fire science in general, as well as their experiences with fire scientists, between survey years 1 and 4.

Similarly, managers' and scientists' attitudes towards their respective exchanges and associated websites had significantly improved between survey years 2 and 4. Thus, the results suggested that the JFSP Fire Science Exchange Network is achieving its goal of serving as an effective outreach organization.

Project Level

The outcomes research based on finer grained data has also been highly informative. Seesholtz (2008) found that more than half of the management documents he examined cited JFSP-funded research. Specifically, the documents cited 30 studies, mostly in relation to fuels treatment planning. Hunter's (2016) study yielded similar results in that managers tended to search for applied science largely when it supported planning or when it informed or supported treatment practices.

Hunter (2016) analyzed 122 agency planning and policy documents to determine how many of them included citations from a random sample of 48 JFSP-funded projects. She found that 86 of the documents (about 71 percent) included citations of final project reports and published journal papers from the sample projects. Citations of 41 out of the 48 sample projects occurred in at least one planning or policy document, and citations of 26 out of those 41 occurred in more than one document. Citations of 13 of the 41 projects occurred in documents in more than one Fire Science Exchange Network region, indicating a broad applicability of the science.

Boundary spanners and principal investigators who responded to Hunter's (2016) survey indicated many ways that managers have used the cited JFSP research. Boundary spanners indicated awareness of 37 out of the 48 projects in the sample. Of those 37, they indicated that managers used 23 of the projects for management planning; 22 to inform, revise, or support treatment prescriptions; and 12 in development of models or decision support tools (Figure 3). Only about 5 of the projects had an impact on policy decisions. Finally, examples of user-identified barriers to research use were lack of managers' awareness of science and lack of time or resources for managers to access, read, and assimilate science information. Other barriers identified included uncertainty about science findings and political or social obstacles outside and within agencies.

Adaptive Management Based on Results

Outcomes research funded by the JFSP has helped program managers and the JFSP Governing Board evaluate program effectiveness. The research has also helped the JFSP and the exchanges implement a number of changes to improve their science outreach efforts and foster better communication between managers and scientists.

Early program efforts (Barbour 2007; Seesholtz 2008; Wright 2010) led to the establishment of the Fire Science Exchange Network in 2009, which provided an increasingly effective boundary-spanning infrastructure. Recent work (Sicafuse et al. 2011; Maletsky et al. 2016; Hunter 2016) shows not only that managers are using fire science but also that science outreach has improved markedly since the network was established.

Perhaps the most effective response to research results has been the ongoing improvements within the Fire Science Exchange Network. Those boundary spanners have worked diligently to maintain open lines of communication between land managers and researchers, and the network has provided increasing educational opportunities through research syntheses and briefs, webinars, training opportunities, field trips,

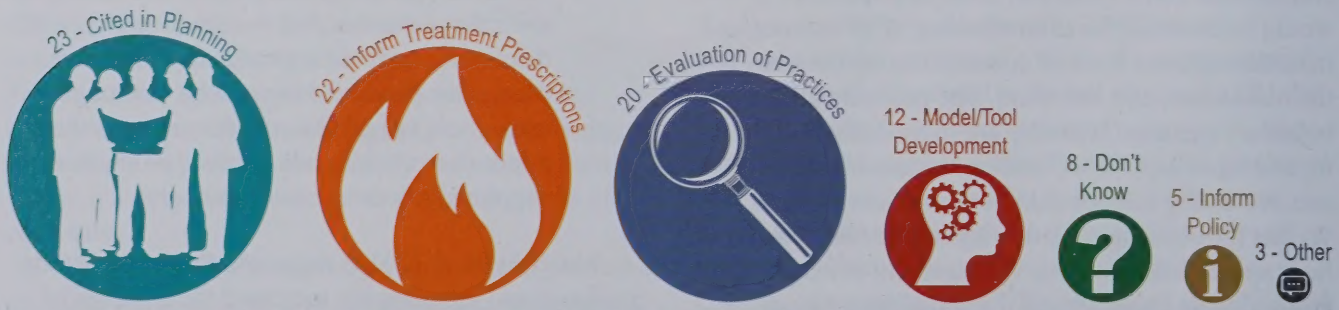

23 - Cited in Planning
22 - Inform Treatment Prescriptions
20 - Evaluation of Practices
12 - Model/Tool Development
8 - Don't Know
5 - Inform Policy
3 - Other

Figure 3. The number of projects (out of 37 of the sample projects) that fall within various use categories as indicated by boundary spanners in response to the survey question, "How has information from projects been used by managers?" Responses from principal investigators were similar.

social media platforms, and other well-received outreach techniques.

The JFSP has also employed multiple feedback loops to gather continuous input from land managers, principal investigators, and boundary spanners (Figure 4) about research needs, issues, and outcomes. In particular, the Fire Science Exchange Network plays an important role in soliciting research needs from communities and feeding that information back to the JFSP. Each year, the JFSP Office staff and its Governing Board use this feedback as an important basis for developing future task statements.

The functioning of the JFSP itself provides other examples of adaptive management in response to outcomes research to date. Acting on one of Barbour's (2007) recommendations, the JFSP Governing Board subsequently directed the program to employ a corporate technology transfer model rather than the previous ad hoc model. That is, rather than relying solely on principal investigators to determine outreach priorities and practices, the JFSP now encourages principal investigators to work in conjunction with their respective fire science exchanges to develop science delivery plans. Another improvement is that the JFSP has helped fund an increasing number of science syntheses in recent years, such as General Technical Reports (GTRs). Since 2006, the JFSP has also maintained a searchable database of past and current research projects on its website (visit https://www.firescience.gov/JFSP_research.cfm) (see sidebar titled "Searching the JFSP Database"). The JFSP produced these and other technology transfer tools in response to user suggestions, and the tools now serve as go-to sources for those seeking the latest fire science.

". . . the Fire Science Exchange Network plays an important role in soliciting research needs from communities and feeding that information back to the JFSP . . ."

Barriers to effective dissemination and use of science information still exist; however, some of those barriers stem from external factors that the JFSP and its associated principal investigators often have only limited ability to address. The JFSP will continue to address those issues that it can to improve program quality and outreach.

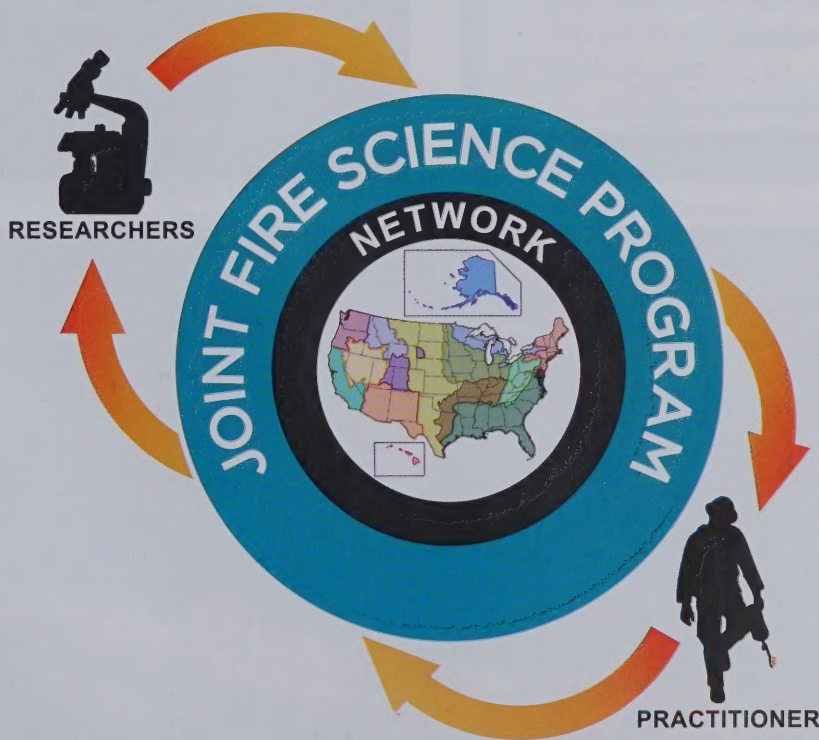
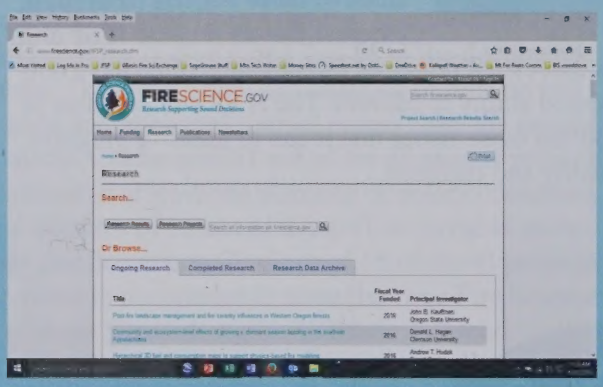


Figure 4. Multiple feedback loops used by the JFSP. Program Office staff and Governing Board members decide which research to solicit after gathering input from key parties: Fire Science Exchange Network, potential end users such as fire managers, and past and prospective researchers. Resultant research is then delivered through the Fire Science Exchange Network to users. The boundary-spanning role of the Fire Science Exchange Network is indispensable because it fosters communication between practitioners and researchers.

Searching the JFSP Database

Did you know that the JFSP website contains a searchable database to help users locate research projects that received financial support from the program? To use the tool, simply click on the *Research* tab on the upper-left side of the JFSP home page, then activate the *Research Results* or *Research Projects* buttons. You can then use a series of data fields and associated drop-down menus to locate research according to project numbers, research themes, or geographic regions. Or you could open the *Ongoing Research* or the *Completed Research* tabs to activate comprehensive lists of all JFSP-funded research to date. At that point, you could use the Ctrl-F keyboard command (or Command-F for Mac computers) to narrow your search according to logical keywords. For example, a person interested in locating sagebrush- (*Artemisia* spp.) related research could use search words like sagebrush, Great Basin, cheatgrass (*Bromus tectorum*), sage-grouse (*Centrocercus* spp.), and so on.



Future Outcomes: How You Can Contribute

The JFSP and its fire science exchanges welcome your feedback and suggestions because fostering open communications between researchers and end users has always been a key function of the program. To participate, please visit the main website at **www.firescience.gov** and click on the *Contact Us* link. Of course, you can also access the individual network websites by clicking on the *Fire Science Exchange Network* link on the main website or going directly to **http://www.firescience.gov/JFSP_exchanges.cfm**. Then click on any given region of the interactive map to activate the selected exchange's website, and from there you can join or use any of various feedback mechanisms such as the *Contact Us* and *Discussion Forum* links.

References

Barbour, J. 2007. Accelerating adoption of fire science and related research. Final report for Joint Fire Science Program project 05-S-07. Boise, ID.

Brown, J.K. and J.K. Smith, eds. 2000. Wildland fire in ecosystems: Effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT. 257 pp.

Finch, D.M. and M. Patton-Mallory. 1993. Closing the gap between research and management. In: Finch, D.M. and P.W. Stangel (eds.). Status and management of neotropical migratory birds; September 21-25, 1992; Estes Park, Colorado. Gen. Tech. Rep. RM-229. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. pp. 12–16.

Hunter, M.W. 2016. Outcomes of fire research: Is science used? International Journal of Wildland Fire 25(5):495–504.

Kocher, S.D., E. Toman, S.F. Trainor, V. Wright, J.S. Briggs, C.P. Goebel, E.M. MontBlanc, A. Oxarart, D.L. Pepin, T.A. Steelman, A. Thode, and T.A. Waldrop. 2012. How can we span the boundaries between wildland fire science and management in the United States? Journal of Forestry 110(8):421–428.

Maletsky, L., L. Sicafuse, W. Evans, and L. Singletary. 2016. Joint Fire Science Program Fire Science Exchange Network 2015 Evaluation Report. Annual report for Joint Fire Science Program project 10-S-02-06. Boise, ID.

McLaughlin, J.A. and G.B. Jordan. 1999. Logic models: A tool for telling your program's performance story. Evaluation and Program Planning 22(1):65–72.

Ottmar, R.D., D.V. Sandberg, C.L. Riccardi, and S.J. Prichard. 2007. An overview of the Fuel Characteristic Classification System—Quantifying, classifying, and creating fuelbeds for resource planning. Canadian Journal of Forest Research 37(12):2383–2393.

Seesholtz, D. 2008. Evaluation of science delivery of Joint Fire Science Program research. Final report for Joint Fire Science Program project 07-S-04. Boise, ID.

Sicafuse, L., L. Singletary, and W. Evans. 2011. A cluster evaluation of the process and impacts of the Joint Fire Science Program regional consortia: Initial survey and webmetrics report 2010–2011. Annual report for Joint Fire Science Program project 10-S-02-06. Boise, ID.

Wright, V. 2007. Communication barriers to applying federal research in support of land management in the United States. In Miner, C.R. Jacobs, D. Dykstra, and B. Bittner (eds.). Proceedings: International conference on transfer of forest science knowledge and technology. Gen. Tech. Rep. PNW-GTR-726. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 255 pp.

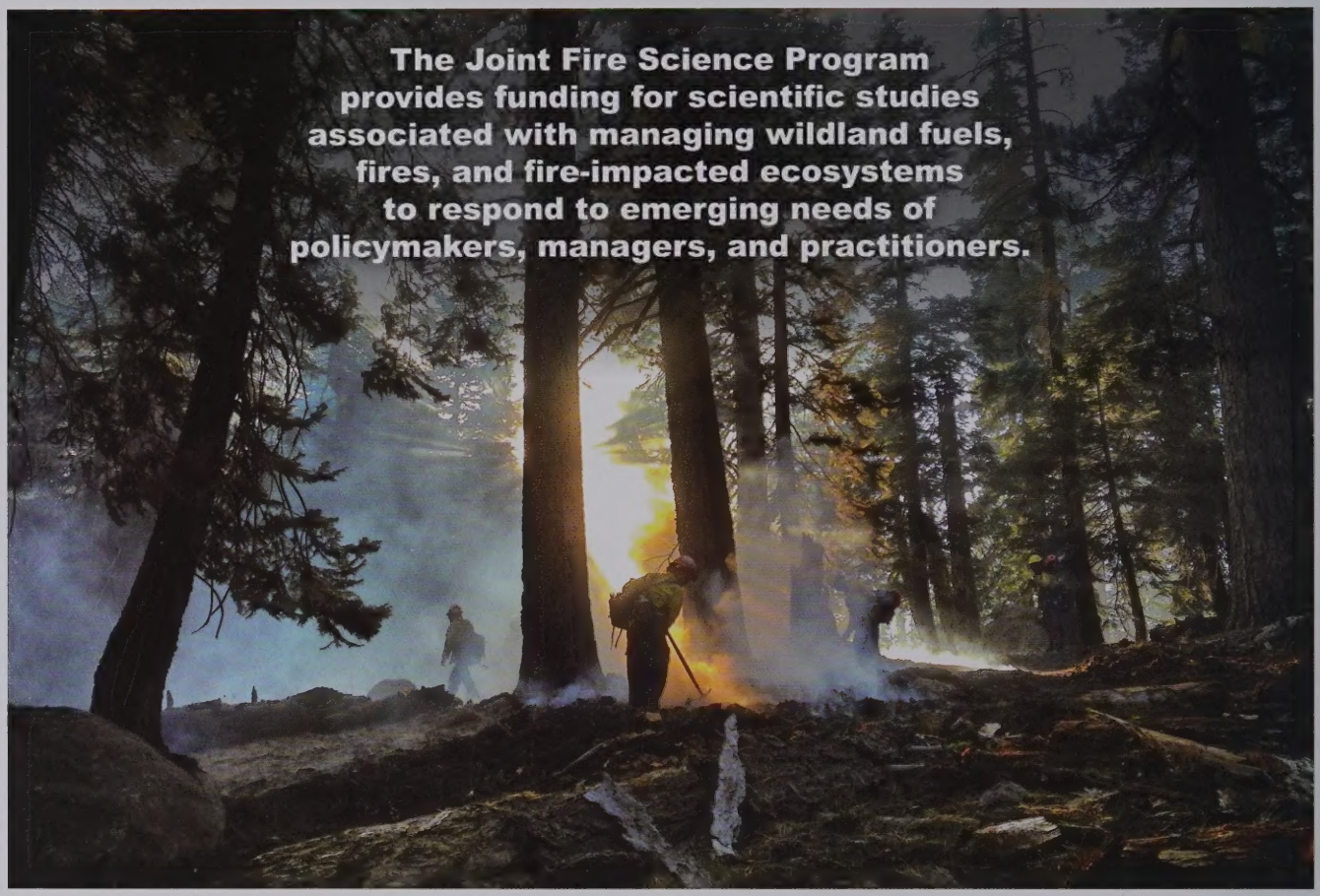
Wright, V. 2010. Influences to the success of fire science delivery: Perspectives of potential fire/fuels science users. Final report for Joint Fire Science Program project 04-4-2-01. Boise, ID.

Wright, C.S., R.E. Vihnanek, and R.D. Ottmar. 2007. Digital photo series. Final report for Joint Fire Science Program project 04-4-1-02. Boise, ID.

AN INTERAGENCY RESEARCH, DEVELOPMENT, AND APPLICATIONS PARTNERSHIP

DOI Office of Wildland Fire

USGS science for a changing world


The Joint Fire Science Program
provides funding for scientific studies
associated with managing wildland fuels,
fires, and fire-impacted ecosystems
to respond to emerging needs of
policymakers, managers, and practitioners.

JFSP *Fire Science Digest*
is published several times a year.
Our goal is to help managers
find and use the best available
fire science information.

Credits

Writer – Stephen W. Barrett

Managing Editor – Tammie Adams

Design and Layout – Jennifer Kapus

The mention of company names,
trade names, or commercial products
does not constitute endorsement
or recommendation for use
by the federal government.

Learn more about
the Joint Fire Science Program at

www.firescience.gov

Coleen Haskell, Communications Director
(208) 387-5865
National Interagency Fire Center
3833 S. Development Ave.
Boise, ID 83705-5354